



COMPARATIVE STUDY OF EPIDURAL ROPIVACAINE 0.2% AND BUPIVACAINE 0.125% FOR POST-OPERATIVE ANALGESIA UNDER GOING LOWER ABDOMINAL AND LOWER LIMB SURGERIES: A RANDOMIZED, DOUBLE BLIND, CONTROL STUDY.

Anaesthesiology

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ABSTRACT

Background And Aims: Study was carried out to compare the efficacy of continuous epidural infusion of two local anesthetics, ropivacaine and bupivacaine for postoperative analgesia in lower abdominal and limb surgeries.

Material And Methods: A total of 90 patients scheduled for in lower abdominal and limb surgeries under Combined Spinal Epidural (CSE) Anesthesia. Sample was randomized into two study Groups B and R with 45 patients in each group. Patients received continuous epidural infusion of either 0.125% bupivacaine (Group B) or of 0.2% ropivacaine (Group R) at the rate 6 ml/h postoperatively. Hemodynamic parameters, visual analog scale (VAS) for pain, level of sensory block, and degree of motor block (based on modified Bromage scale) were monitored for 48 h postoperatively.

Results: The patients in ropivacaine group showed significantly lower pulse rate as compared to bupivacaine group and significantly lower systolic blood pressure throughout the infusion period as compared to bupivacaine group. The difference in diastolic blood pressure was not significant. The time taken for the sensory block to regress to L1 was longer in ropivacaine group as compared to bupivacaine group.

Conclusion: Patients in the ropivacaine group had better VAS score as compared to bupivacaine, the difference was not statistically significant. There were no side effects like motor weakness, bradycardia or PNOV in any group. Both ropivacaine [0.2%] and bupivacaine [0.125%] are equally safe and are effective in providing postoperative analgesia.

KEYWORDS

Ropivacaine, Bupivacaine, Postoperative Analgesia

INTRODUCTION

Epidural anesthesia is the most commonly used technique for providing not only peri-operative surgical anesthesia but postoperative analgesia in lower abdominal and limb surgeries.^[1] Both bupivacaine and ropivacaine cause similar degree of sensory blockade but ropivacaine is a slower onset, lower intensity, and shorter duration of motor block which facilitates early movement and physiotherapy, with lesser propensity to produce the cardiac and central nervous system toxicity as compared to bupivacaine.^[2] Common techniques of post-operative pain relief after surgery include Oral, intravenous and epidural analgesia with or without opioids as additives, intra-articular drug instillation; femoral, sciatic, Adductor canal nerve block etc. No single technique is superior to other in providing analgesia but a multimodal analgesia provides best result in any patient. Study aimed to compare the analgesic efficacy of epidurally administered bupivacaine (0.125%) with Ropivacaine (0.2%) using Visual Analogue Scale (VAS) for postoperative analgesia in lower abdominal and limb surgeries and hemodynamic parameters.

METHODS

After approval from Institutional Ethical Committee, this prospective randomized double-blind study was conducted and informed consent, 90 adult patients, age group 18-60 year, ASA I and II physical status scheduled to undergo various urological, gynecological or orthopedic procedures under spinal anesthesia were enrolled. Randomization was done into two groups by lottery method. Patients were randomized by computer-generated randomization charts into two study groups, Group B ($n = 45$) received 0.125% bupivacaine and Group R ($n = 45$) received 0.2% ropivacaine postoperatively. Under all aseptic precaution Combined spinal epidural procedure was performed by using the midline approach in sitting position. The epidural space was located at L2-L3 or L3-L4 interspace. After local anesthetic infiltration, Epidural space was located with 16 G Epidural needle using loss of resistance technique than Spinal Anesthesia had given with 12-15mg of heavy bupivacaine [0.5%] by needle through needle technique after free flow of CSF was noted. Spinal needle was removed and the epidural catheter inserted 3-5 cm into epidural space and fixed after confirming negative aspiration for blood and CSF. Surgery was performed after motor and sensory blockade was achieved till T10 dermatome level. At two segment regression of sensory blockade, an epidural bolus injection of bupivacaine [0.5%] was administered to maintain intraoperative sensory level of T10-T12. Near the end of the surgery infusion pump was connected to epidural catheter filled with either of the above drugs. Initial infusion was started at rate of 6ml/hour. The patient was routinely monitored for 2 hours in the Post

Anesthesia Recovery Room and then shifted to ward. The rate of infusion was increased or decreased as per the hemodynamic parameters and VAS score of the patient. Hemodynamic parameters, visual analog scale (0-10), level of sensory block (assessed by pinprick), and level of motor block (based on modified Bromage scale) were monitored for 48 h postoperatively.

Modified Bromage Criteria Score:

1- Complete Block, 2- Almost Complete Block, 3- Partial Block, 4- Detectable weakness In Hip Flexion While Supine, 5- No Detectable Weakness in Hip Flexion While Supine, 6- Able to Perform Partial Knee Bend.

VAS score was more than 3, the rate of infusion was stepped up in a graded manner by 2 ml/h up to 10 ml/h. If not relieved after 10 ml/h, rescue analgesia was given diclofenac 75 mg intramuscularly. Occurrence of motor block, the infusion was stopped temporarily till the Bromage score was 6. The findings were analyzed statistically using Chi-square test and Student's *t*-tests using SPSS version 12 and $P < 0.05$ was considered statistically significant.

RESULTS

There was no significant difference in the demographic data between the two groups ($p > 0.05$). [Table 1]

Table 1: Demographic Data (Mean $\pm$ S.D.)

Parameter	Group B	Group R	P value
Age (years)	35.37 $\pm$ 9.01	39.16 $\pm$ 11.55	>0.05
Male	26	30	
Female	19	15	
ASA 1	42	43	
ASA 2	3	2	
Weight (kg)	58.93 $\pm$ 8.22	58.56 $\pm$ 8.7	
Height (cm)	162.30 $\pm$ 3.41	164.1 $\pm$ 4.38	

The visual analog score throughout the duration was lesser for ropivacaine than bupivacaine. The difference in each instance though was not statistically significant as P value was > 0.05 . [Table 2]

Table 2: VAS Scores (Mean $\pm$ S.D) In Groups

VAS scores	Group B	Group R	P value
baseline	0	0	NA
6 h	4.85 $\pm$ 0.84	4.76 $\pm$ 0.98	0.60
12 h	3.73 $\pm$ 0.82	3.64 $\pm$ 0.86	0.57

24 h	2.67 ± 0.84	2.51 ± 0.90	0.32
36 h	2.71 ± 0.71	2.64 ± 0.77	0.61
48 h	2.15 ± 0.40	2.02 ± 0.65	0.22

The Bromage scale was also comparable in both the groups and there was no statistical difference between both the groups. Patients in both the groups started to gain power in their limbs at the end of first 12 hours but the without the associated pain. [Table 3]

Table 3: Bromage Scale Score (Mean ± S.D) In Groups

Bromage Scale score	Group B	Group R	P value
baseline	0	0	NA
6 h	2.53 ± 0.57	2.73 ± 0.48	0.05
12 h	3.51 ± 0.69	3.62 ± 0.59	0.37
24 h	4.40 ± 0.65	4.44 ± 0.63	0.76
36 h	5.22 ± 0.53	5.36 ± 0.62	0.19
48 h	5.84 ± 0.37	5.85 ± 0.35	0.79

Table 4, Table 5 and Table 6 was showed to decrease in mean heart rate and blood pressure in both groups but more in the Ropivacaine group and it was clinically not significant.

Table 4: Heart Rate (Mean ± S.D) In Groups

Heart rate	Group B	Group R	P value
baseline	78.45 ± 3.71	77.60 ± 3.48	0.21
6 h	109.65 ± 7.22	100.40 ± 8.19	0.001
12 h	99.76 ± 8.64	92.64 ± 8.96	0.001
24 h	91.69 ± 8.33	86.89 ± 7.05	0.001
36 h	88.73 ± 7.45	83.47 ± 5.82	0.001
48 h	85.24 ± 5.46	81.95 ± 5.06	0.001

Table 5: Systolic Blood Pressure (Mean ± S.D.) In Groups

Systolic Blood Pressure	Group B	Group R	P value
baseline	116.11 ± 7.03	113.76 ± 5.69	0.05
6 h	131.42 ± 7.58	126.79 ± 9.03	0.004
12 h	125.51 ± 6.10	122.52 ± 8.04	0.30
24 h	118.38 ± 6.90	114.58 ± 6.55	0.004
36 h	114.53 ± 6.71	11.96 ± 6.68	0.04
48 h	115.48 ± 7.50	110.60 ± 7.06	0.001

Table 6: Diastolic Blood Pressure (Mean ± S.D) In Groups

Diastolic Blood Pressure	Group B	Group R	P value
baseline	76.74 ± 4.14	75.05 ± 4.37	0.08
6 h	86.22 ± 4.38	84.36 ± 4.47	0.03
12 h	81.09 ± 4.76	81.42 ± 5.45	0.73
24 h	81.02 ± 5.32	79.73 ± 5.98	0.24
36 h	79.09 ± 7.05	78.33 ± 7.02	0.57
48 h	79.18 ± 5.98	76.62 ± 7.52	0.05

DISCUSSION

Ropivacaine is a long-acting, enantiomerically pure (S-enantiomer) amide local anesthetic with a high pKa (ionization constant), and low lipid solubility which blocks nerve fibers involved in pain transmission (A delta and C fibers) more than those controlling motor function (A-beta fibers). Thus, it is similar to bupivacaine with regard to pain relief but has less propensity to cause motor blockade at low concentrations.^[2] The quality of analgesia was same for both the drugs with Levo-Bupivacaine group having enhanced motor block than Ropivacaine 0.2% but that was not clinically significant to interfere with early ambulation of patients.

Virmani *et al.* concluded that continuous infusion as compared to intermittent boluses provided better pain relief at rest, on movement and provided sustained degree of analgesia.^[3] Hemodynamic parameters remained stable in both the groups in the postoperative period. However, four patients in the bupivacaine group developed hypotension, of which two patients required temporary withholding of infusion. Only one patient in the ropivacaine group developed hypotension (systolic blood pressure <90 mmHg).^[4]

This hypotension was mild and responded to intravenous fluid. Thus, when used in the said concentrations, both the drugs were found to be safe and had a similar effect on the patient's heart rate and blood pressure. This trend of hemodynamic parameters was similar to that observed by Akifumi *et al.*, Pouzeratte *et al.*, and Finucane *et al.*^[5-7] In our study, the mean quantity of drug required in the postoperative period in ropivacaine group was more than in bupivacaine group as against Korula *et al.*^[8] However, the difference between them was not

statistically significant ($P = 0.102$). Higher doses of ropivacaine as compared to bupivacaine are generally required to elicit equivalent analgesic effects. Bupivacaine is said to be 40% more potent than ropivacaine.^[9] Mean VAS score during the postoperative period was similar in the two Groups and decreased steadily with the progression of infusion. This is similar to the findings reported in earlier studies.^[10-11] No other complications such as nausea, urinary retention, and convulsions were found in our study.

CONCLUSION

Our study showed that analgesic properties of Ropivacaine and Bupivacaine are comparable for use as continuous infusion for epidural analgesia and there is no difference in them if used in equipotent doses. But Ropivacaine with its more suitable toxicity profile with minimal motor block is more favorable for continuous infusion for patients undergoing in lower abdominal and limb surgeries.

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